

Remarks

Claims 1-23, 41-50, and 52-79 are pending in the application. Claims 24-40, and 51 have been canceled. Claims 1-23 and 41-50 and 52-58 have been amended. New claims 59-79 have been added. The references in the IDS that were not previously properly submitted are attached. Applicant respectfully requests that they now be made of record in the case. The drawings have been amended as required by the Examiner and are attached. The specification has been amended to correct minor errors. No new matter has been added by virtue of this amendment. Reconsideration of the application as amended is requested.

IDS

The Examiner states that the IDS filed 12/2/02 fails to comply with 37 CFR 1.98(a)(2) which requires a legible copy of each US and foreign patent and publication. Applicant is attaching to this amendment new complete copies of those references deleted by the Examiner. Applicant is also including a clean copy of the originally filed IDS. Applicant requests that these references now be considered by the Examiner.

The Examiner further states that the IDS filed 12/2/02 fails to comply with 37 CFR 1.98(a)(2) because it does not include a concise explanation of the relevance of each patent listed that is not in English. Applicant is attaching to this amendment a copy of the US counterpart application with its English translation. Applicant is adding this US counterpart reference to the IDS.

Thus, the objections to the IDS have been traversed.

Drawings

The Examiner states that Figures 1 and 1a should be designated by a legend such as -Prior Art- because only that which is old is illustrated. Corrections to FIGS. 1 and 1a, labeled Prior Art are attached.

Claim Rejections-35 U.S.C. § 112 second paragraph

The Examiner rejects claims 1-22, 26, 27, 37, 44-47, and 55 under 35 U.S.C. § 112, second paragraph, as being indefinite. The claims have been canceled or amended to fix the problems cited by the Examiner.

Claim Rejections--35 U.S.C. § 103(a)

The Examiner rejects claims 1-11, 18, 20-23, 41-48, 55, and 57-58 under 35 U.S.C. § 103(a), as being unpatentable over JP 5-13396 in view of Bran (US patents 5,090,432 and 5,286,657) and JP 7-211,684.

However, applicant would respectfully ask the Examiner to consider that Claim 1, as amended provides:

1. (Currently amended) A method for megasonic cleaning a substrate, comprising the steps of:

- a) providing a container;
- b) providing a first megasonic transducer with a first active surface or a first array of megasonic transducers with a first array active surface in said container;
- c) disposing a substrate in said container substantially parallel to and spaced a first spacing from said first active surface or from said first array active surface;
- d) flowing a fluid through said first spacing;
- e) immersing the substrate in said fluid in said container; and
- f) applying energy to said first megasonic transducer or to said first array of megasonic transducers to provide vibration in said fluid and to clean the substrate **wherein no substantially comparable amount of energy is provided to a transducer having an active surface facing perpendicular to said first active surface or perpendicular to said first array active surface.**

JP 5-13396 teaches providing substantial energy to a transducer having an active surface facing perpendicular to said first active surface or perpendicular to said first array active surface. With the angle of 20 to 70 degrees provided in paragraph 0008 (see attached translation from the JPO web site) and shown in FIG. 1, transducer 11 in FIG. 2a should provide in the range from 36% to 2.74 times the energy provided by transducers 9a-9d. Thus, JP 5-13396 provides substantial energy to the transducer facing perpendicularly in contrast to claim 1, as amended.

Bran also has a transducer positioned so its active surface is perpendicular to a plane parallel to the substrate surface.

JP 7-211,684 teaches against the idea of no substantially comparable amount of energy provided to a transducer having an active surface facing perpendicular to the

wafer. In the description of drawing 2, the JP 7-211,684 patent describes only the disadvantage of the illustrated embodiment with transducer 111 located along the bottom of tank 109b which provides wafer 101 tilted with respect to transducer 111. The translation of the JP 7-211,684 patent available on the JPO website states:

megasonic vibrator 111 was sideways attached in side-attachment-wall 109a of the outside tub 109 for making the whole equipment cheap to a thin shape again. if the megasonic vibrator 111 is incidentally attached in bottom plate 109b of the outside tub 109 as shown in drawing 2 -- equipment -- ***** -- natural, **although it becomes large-sized and** the vibrator 111 corresponding to the surface integral of a wafer 101 is **needed and uneconomical** upwards -- it is also possible to make it such composition in consideration of other conditions etc. (paragraph [0033] of detailed description).

<http://www6.ipdl.jpo.go.jp/Tokujitu/tisogodbenk.ipdl>

Thus, to the extent the JP 7-211,684 patent describes the idea of having the transducer as shown in FIG. 2, it teaches against that configuration. All other drawings in the JP 7-211,684 patent show the megasonic vibrator 111 or 4 located on the side of wafer 101, 801. Thus, the references individually and in combination do not teach or suggest the limits of claim 1, as amended.

It was applicant who was first to recognize that the perpendicular facing transducer was not needed and that only transducers arranged parallel to the substrate were needed. Applicant recognized that each transducer of an array of transducers shines vibration at the entire substrate, and therefore most portions of the substrate are receiving vibration at an angle. Hence no transducer is specially needed to provide perpendicular vibration. Applicant further recognized that adding in vertical vibration, as in the JP 5-13396 patent, introduces problems from interference of the waves from the various sources. Thus, applicant found substantial benefit in avoiding providing such a perpendicularly oriented transducer as taught by the JP5-13396, Bran, and Ferrill references.

Therefore the rejection of claim 1 and claims dependent thereon, under 35 U.S.C. § 103(a), has been traversed.

Applicant would further respectfully ask the Examiner to consider that Claim 41, as amended provides:

41. An apparatus for megasonic cleaning a substrate, comprising:

a container for immersing a substrate in a fluid;

a first megasonic transducer with a first active surface or a first array of megasonic transducers with a first array active surface for providing energy to clean the immersed substrate when the substrate is placed substantially parallel to and spaced from said first active surface or from said first array active surface, wherein no transducer is in said container having an active surface facing perpendicular to said first active surface or perpendicular to said first array active surface.

JP 5-13396 teaches providing a transducer having an active surface facing perpendicular to said first active surface or perpendicular to said first array active surface. Thus, JP5-13396 teaches against the limit provided in claim 41, as amended.

Bran also has a transducer positioned so its active surface is perpendicular to a plane parallel to the substrate surface. JP 7-211,684 teaches alternatives to disposing a substrate in said container substantially parallel to the first active surface of the transducer. The references individually and in combination do not teach or suggest the limits of claim 41, as amended. Therefore the rejection of claim 41 and claims dependent thereon, under 35 U.S.C. § 103(a), has been traversed.

The Examiner rejects claims 12-17, 24-40, 41-48, and 49-54 under 35 U.S.C. § 103(a), as being unpatentable over JP 5-13396 in view of Bran (US patents 5,090,432 and 5,286,657) and JP 7-211,684, further in view of Ferrell or Fishkin.

However, applicant would respectfully ask the Examiner to consider that Ferrell teaches the idea of providing multiple transducers at right angles to each other. There is no teaching or suggestion that no substantially comparable amount of energy is provided to a transducer having an active surface facing perpendicular to said first active surface or perpendicular to said first array active surface, as provided in claim 1, as amended. Ferrell's examples all have a transducer perpendicular to a pair of facing transducers (see column 4, lines 34-47). Nor is there teaching or suggestion of flowing a fluid. Nor is there teaching or suggestion of disposing a substrate in the container substantially parallel to and spaced a first spacing from the first active surface, as provided in claim 1, as amended. In FIG. 1 of Ferrell, the transducers are all offset from the substrate. Claim 41 has similar limits and is similarly distinguished.

Applicant would also respectfully ask the Examiner to consider that Fishkin teaches against the idea of providing a transducers with active surfaces parallel to the substrate. Fishkin aims his transducers at an angle to the substrate and to each other. Thus, there is no teaching or suggestion of disposing a substrate in the container substantially parallel to and spaced a first spacing from the first active surface, as

provided in claims 1 and 41, as amended. In Fishkin the substrate is at an angle to both active surfaces of the transducers.

Therefore the rejection of claims 12-17, 24-40, 41-48, and 49-54 under 35 U.S.C. § 103(a), as being unpatentable over JP 5-13396 in view of Bran (US patents 5,090,432 and 5,286,657) and JP 7-211,684, further in view of Ferrell or Fishkin has been traversed.

The Examiner rejects claims 38 and 52 under 35 U.S.C. § 103(a), as being unpatentable over JP 5-13396 in view of Bran (US patents 5,090,432 and 5,286,657) and JP 7-211,684, further in view of Ferrell or Fishkin and further in view of Bok. The Examiner states that horizontal positioning is conventional and he cites Bok as evidence.

However, applicant would respectfully ask the Examiner to consider that claim 38 has been canceled. Claim 52 provides:

52. The apparatus as recited in claim 51, wherein said array of transducers are disposed horizontally and wherein openings between transducers permit fluid to flow there through.

Claim 52 depends on claim 51 which provides that the first transducer comprises an array of transducers. Claim 51 depends on claim 49 which provides a second transducer and two sided cleaning. Claim 49 depends on claim 41, which provides:

41. An apparatus for megasonic cleaning a substrate, comprising:

a container for immersing a substrate in a fluid;

a first megasonic transducer with a first active surface or a first array of megasonic transducers with a first array active surface for providing energy to clean the immersed substrate when the substrate is placed substantially parallel to and spaced from said first active surface or from said first array active surface, wherein no transducer is in said container having an active surface facing perpendicular to said first active surface or perpendicular to said first array active surface.

Applicant would respectfully ask the Examiner to consider that Bok teaches against the idea of immersing the substrate. In Bok, the substrate is outside the fluid and contacts the fluid on one surface as the fluid is raised above the edge of the container by action of the ultrasonic transducer. Bok achieves flow since the fluid level is above that container edge. The flow technique of Bok would be defeated by immersion. The meniscus method provided by Bok requires horizontal positioning but there is no teaching or suggestion of using horizontal positioning and also immersing the substrate; such immersion would prevent the flow on which Bok relies. While JP 5-13396 and Bran and

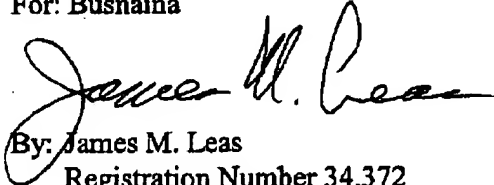
other references teach immersion, their teaching could not be provided in Bok without defeating the flow technique he teaches. Further, there would be no way to provide the two sided cleaning of claim 49 on which claim 52 depends with the one sided technique of Bok. Thus, the rejection of claim 52 under 35 U.S.C. § 103(a), as being unpatentable over JP 5-13396 in view of Bran (US patents 5,090,432 and 5,286,657) and JP 7-211,684, further in view of Ferrell or Fishkin and further in view of Bok has been traversed.

The Examiner rejects claims 19 and 56 under 35 U.S.C. § 103(a), as being unpatentable over JP 5-13396 in view of Bran (US patents 5,090,432 and 5,286,657) and JP 7-211,684, further in view of Bok. The Examiner states that the Examiner's position is that horizontal positioning is conventional and he cites Bok as evidence. The Examiner further states that "it would have been obvious to an ordinary artisan to place the wafer vertically in the modified position of JP 5-13395 in order to simplify moving the substrate for further processing." Applicant requests clarification of this point. Applicant does not understand what the Examiner means in saying that placing the wafer vertically in the modified position of JP 5-13395 concerning rendering obvious the idea of placing the wafer horizontally?

In any case, claim 19 depends on claim 1, as amended, which provides "immersing the substrate in said fluid in said container." As described herein above, Bok expressly teaches against immersion. Similarly, claim 56 depends on claim 41, which provides for immersion. The whole reason Bok uses a horizontal substrate is to avoid immersion so as to obtain his flow technique. Thus, the rejection of claim 52 under 35 U.S.C. § 103(a), as being unpatentable over JP 5-13396 in view of Bran (US patents 5,090,432 and 5,286,657) and JP 7-211,684, further in view of Bok has been traversed.

It is believed that the claims are in condition for allowance. Therefore, applicant respectfully requests favorable reconsideration. If there are any questions please call applicant's agent at 802 864-1575.

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